The Johns Hopkins University
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Power Subsystem Update

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Power system updates

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- **Load definition**
  - **Same as presented in November**
  - **Launch timeline still awaiting launch vehicle selection.**
- **Battery size increased**
  - **21 Ah S-NiCd (SWAS) allows feasibility of 95% of parametric Athena launch timelines.**
  - **LVS time margin increased**
  - **23.8 kg, 15” × 9.5” × 5”**
- **S/A Tradeoff: GaAs to MJ**
  - **Same size array assumed (3.35 m^2)**
    - **Increase margin from 20.8% to approximately 39.5%**
    - **Increase cost by about 16%**
  - **Baseline remains GaAs to date.**
- **Shuttle option effects upon battery and system reviewed.**

Shuttle Option Impact on Battery and System

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- **Pre-release discharge and top-off required after extended open circuit stand.**
  - **Thermal control may be required to maintain temperature.**
  - **Battery must start with brief (5-10 minute) discharge at 1-2 A rate.**
    - **Options:**
      - **Addition of discharge circuit to S/C**
      - **Addition of discharge circuit to Shuttle**
      - **Use of spacecraft loads without solar array input (discharge uncontrolled)**
  - **Battery recharge (C/10) must be VT limited.**
    - **Options:**
      - **Power up spacecraft on deployed panel power**
        - **(if angle and thermal OK)**
      - **Power up spacecraft though shuttle via the PPTs**
        - **(need to know max shuttle power availability)**
      - **Addition of VT controller on S/C**
      - **Addition of VT controller on Shuttle.**
  - **Approximately 4-6 hours of battery pre-release activities required.**
- **Battery size may change due to new load profile requirements.**
  - **Load and eclipse profile for post-power up not yet defined.**

Solar STEREO
Load Power Budget

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Solar Stereo Power Budget	Revision 7	11-Nov-98		
			Solar Only	Battery Required
Subsystem / Component	Average Power	Aggregate Power	Peak Normal Ops	Propulsion Events
Instruments	**52**	**70**	**70**	**70**
EPD	2	2	x	x
HI	15	20	x	x
Mag	2	2	x	x
RBT	4	12	x	x
SCIP	15	20	x	x
SWPA	2	2	x	x
SWPA Electronics	2	2	x	x
DPU	10	10	x	x
IEM	**57**	**61.6**	**57.0**	**57.0**
C&DH Processor		10.4	x	x
C&T Subsystem		2.7	x	x
SSR (3of3)		16.5	x	x
Downlink Subsystem		5	x	x
Uplink Subsystem		7	x	x
RIU (5of5)		1.5	x	x
DC/DC Conv. (70%eff)		18.5	18.5	18.5
RF	**80.8**	**80.8**	**80.8**	**80.8**
SSPA	80	80	x	x
USO	0.8	0.8	x	x
G&C	**74.5**	**125.5**	**74.5**	**125.5**
AIE	7	7	x	x
G&CC	20	20	x	x
RWA	9	60	9	60
ST	12.5	12.5	x	x
Gyro	25	25	x	x
Sun Sensor	1	1	x	x
Propulsion	**3.5**	**56**	**6.0**	**51.0**
Pressure sensor (2of2)	1	1	x	x
HPLV	0	25		non-simultaneous
Thrusters (1 of 4)	0	25		2
Tank Heater	2.5	5	x	
Thermal	**5**	**20**	**20**	**0**
Heaters	5	20	x	
Power	**13.1**	**19.3**	**19.3**	**19.3**
PSE	13.1	19.3	x	x
Average subtotal for thermal:	278.4	System total:	328	404
(S/C and Propulsion heat not included)	20.0%	Allocated Margin:	20.0%	20.0%
	334	Req'd Total:	393	484

Solar STEREO Preliminary Parametric Battery Performance on Launch

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					Battery Sizes (Ah)		
					9	12	21
	Load with 20% Margin (W)				Median DOD's		
	118	201	307		86.9%	65.2%	37.2%
Coast time	**Phase 1**	**Phase 2**	**Phase 3**				
(min)	(min)	(min)	(min)		DOD	DOD	DOD
0	3	8	11		35.3%	26.5%	15.1%
5	8	8	11		39.2%	29.4%	16.8%
10	13	68	11		**122.9%**	**92.2%**	52.7%
15	18	38	11		**86.9%**	65.2%	37.2%
20	23	26	11		**74.8%**	56.1%	32.1%
25	28	20	11		**70.8%**	53.1%	30.3%
30	33	14	11		**66.7%**	50.0%	28.6%
35	38	11	11		**66.6%**	50.0%	28.5%
40	43	8	11		**66.5%**	49.9%	28.5%
45	48	5	11		**66.4%**	49.8%	28.5%
50	53	5	11		**70.3%**	52.8%	30.1%
55	58	17	11		**90.2%**	**67.6%**	38.7%
60	63	14	11		**90.1%**	**67.6%**	38.6%
65	68	8	11		**86.0%**	64.5%	36.9%
70	73	8	11		**89.9%**	**67.5%**	38.5%
75	78	5	11		**89.9%**	**67.4%**	38.5%
80	83	2	11		**89.8%**	**67.3%**	38.5%
85	88	2	11		**93.7%**	**70.3%**	40.1%
90	93	11	11		**109.5%**	**82.2%**	46.9%
95	98	11	11		**113.4%**	**85.1%**	48.6%
100	103	134	11		**280.9%**	**210.6%**	**120.4%**